LIST OF SYMBOLS

Symbol	Unit	Description
α	1/cm	Optical absorption coefficient
α_1	1/cm	Optical absorption coefficient at 1.0 eV obtained from CPM
C	pF/cm^2	Capacitance of heterojunction
C_2	pF/cm^2	Saturated capacitance at higher forward biases
c_{sw}	cm^3/s	Constant of the Staebler-Wronski effect
γ_a	cm^3/s	Pre-exponential factor of bimolecular decay rate
dV/dt	V/s	Voltage sweep rate
D(E,t)		Function which takes a maximum at $e_n(E)t=1$
d_s	cm	Thickness of interface layer
δ_1	eV	E_F-E_V in p c-Si
δ_2	eV	E_C-E_F in a-Si:H
E_a	eV	Activation energy of thermal annealing
ΔE_{af}	eV	Activation energy of a pre-exponential factor (I_0) for forward currents
E_{BT}	eV	Characteristic energy for conduction-band tail
E_F	eV	Fermi level
E_F^a	eV	Fermi level in a neutral region of a-Si:H
E_{Fn}	eV	Quasi-Fermi level of electron in the depletion region
E_{Fp}	eV	Quasi-Fermi level of holes in the depletion region
E_{g1}	eV	Energy bandgap of c-Si
E_{g2}	eV	Energy bandgap of a-Si:H
E_0	eV	Optical gap determined by Tauc plot
E_{OB}	eV	Energy level at which a thermal emission rate for electrons equals to one for holes
E_{OB}^a	eV	E_{OB} in a neutral region of a-Si:H
E_p	eV	Energy level of a peak value of g(E)
E_{p1}	eV	Energy level of a peak value of g(E) with

		a small ν_n
E_{p2}	eV	Energy level of a peak value of g(E) with a large ν_n
E_T	eV	Energy level of the gap state where a tunneling hole combines with an electron or emits into the valence band in a-Si:H
E_w	eV	Half width of Gaussian distribution
E_{rI}	V/cm	Electric field at $x=W_{OB}$
E_m	eV	Energy at which D(E,t) takes a maximum value
E_C	eV	Conduction-band edge
ΔE_C	eV	Conduction-band discontinuity
E_V	eV	Valence-band edge
ΔE_V	eV	Valence-band discontinuity
ΔE_ν	eV	Activation energy for ν_n
$e_n(E)$	1/s	Thermal emission rate of electrons
$e_p(E)$	1/s	Thermal emission rate of holes
ε_0	pF/cm	Free space permittivity
ε_{s1}	pF/cm	Semiconductor permittivity for c-Si
ε_{s2}	pF/cm	Semiconductor permittivity for a-Si:H
$F_\infty(E)$		Occupation function at $t=\infty$ s
$f(E)$		Occupation function at t=0 s (i.e., Fermi-Dirac distribution function)
G	$1/cm^3 s$	Carrier generation rate by light exposure
g(E)	$1/cm^3 eV$	Density-of-state distribution in a-Si:H
g(E,0)	$1/cm^3 eV$	Midgap-state profile in light-soaked film
$g_0(E)$	$1/cm^3 eV$	Midgap-state profile in as-deposited film
g(E,t)	$1/cm^3 eV$	Midgap-state profile at thermal annealing time t
$\Delta g(E,t)$	$1/cm^3 eV$	$g(E,t)-g_0(E)$ at thermal annealing time t
g_{max}	$1/cm^3 eV$	Maximum value of g(E) with Gaussian distribution
H(t)	$1/cm^3$	Transient HMC (heterojunction-monitored capacitance) signal
$h\nu$	eV	Photon energy
I	A	Current
k	eV/K	Boltzmann constant
L	cm	Thickness of a-Si:H

μ_2	cm^2/Vs	Mobility in a-Si:H
μ_n	cm^2/Vs	Mobility of electrons
μ_p	cm^2/Vs	Mobility of holes
ν_a	$1/s$	Pre-exponential factor of monomolecular decay rate
ν_n	$1/s$	Pre-exponential factor of thermal emission rate (attempt-to-escape frequency) for electrons
ν_{n0}	$1/sK^2$	Pre-exponential factor of ν_n with temperature dependence
ν_{n1}	$1/s$	Small attempt-to-escape frequency for electrons
ν_{n2}	$1/s$	Large attempt-to-escape frequency for electrons
ν_p	$1/s$	Pre-exponential factor of thermal emission rate (attempt-to-escape frequency) for holes
N_A	$1/cm^3$	Density of acceptors in p c-Si
N_C	$1/cm^3$	Effective density of states in the conduction band
$N(E_C)$	$1/cm^3eV$	Density-of-state distribution at a bottom of the conduction band
N_I	$1/cm^3$	Midgap-state density (i.e., space-charge density) graphically estimated from the steady-state HMC method
N_I^*	$1/cm^3$	Density of midgap states between E_F and E_{OB} in a-Si:H
$N_I(t)$	$1/cm^3$	Midgap-state density (space-charge density) at time t
$\Delta N_I(t)$	$1/cm^3$	Change in space-charge density at time t
$N_I(\infty)$	$1/cm^3$	Space-charge density at $t=\infty$ s
N_s	$1/cm^3$	Bulk spin density obtained from electron spin resonance (ESR) measurements
$N_s(t)$	$1/cm^3$	Bulk spin density from ESR at light-soaking time t
N_s^*	$1/cm^3$	Density of defects between p c-Si and a-Si:H in plate of interface layer (i.e.,

		interface and the near-interface regions)
N_V	$1/cm^3$	Effective density of states in the valence band
N_1	$1/cm^3$	Density of first states
N_2	$1/cm^3$	Density of second states
n	$1/cm^3$	Electron density in the conduction band of a-Si:H
n_{BT}	$1/cm^3$	Electron density in conduction-band tail
n_i	$1/cm^3$	Intrinsic carrier density in a-Si:H
$n_T(E)$	$1/cm^3$	Density of traps occupied by electrons
$n_T(E;t)$	$1/cm^3$	Density of traps occupied by electrons at time t
Δn	$1/cm^3$	Electron density under light exposure
p	$1/cm^3$	Hole density in the valence band of a-Si:H
$p_T(E)$	$1/cm^3$	Density of traps occupied by holes (i.e., density of empty traps)
Δp	$1/cm^3$	Hole density under light exposure
Q_{rI}	C/cm^2	Space charge in region I ($W_{OB} \leqq x \leqq W_2$) in a-Si:H
Q_{ss}	C/cm^2	Space charge in interface layer
ρ_I	C/cm^3	Space-charge density in region I
ρ_2	Ω cm	Dark resistivity of a-Si:H
q	C	Magnitude of electronic charge
σ_2	S/cm	Dark conductivity of a-Si:H
σ_n	cm^2	Capture-cross section of electrons
σ_{n1}	cm^2	Small capture-cross section of electrons
σ_{n2}	cm^2	Large capture-cross section of electrons
σ_p	cm^2	Capture-cross section of holes
$\Delta \sigma_p$	S/cm	Increment of conductivity using a small incident light flux with a 2-eV photon energy
$\Delta \sigma_{ph}$	S/cm	Photoconductivity with AM1 light
S	cm^2	Electrode area
T	K	Measuring absolute temperature
T_{fr}	℃ (or K)	Freeze-in temperature
T_{RC}	℃ (or K)	Temperature from which a film is rapidly cooled by liquid N_2

T_{room}	°C (or K)	Room temperature
T_s	°C (or K)	Substrate temperature during deposition
t_{IL}	s	Illumination time
τ_f	s	Filling time
$u(x)$	eV	Energy at position x
u_{OB}	eV	Energy at $x = W_{OB}$
ϕ_m	eV	Work function of metal
ϕ_s	eV	Work function of a-Si:H
V	V	Applied bias voltage ($V = V_1 + V_2$)
V_B	V	Built-in potential graphically estimated from steady-state HMC method
V_{B1}	V	Built-in potential at heterojunction for c-Si
V_{B2}	V	Built-in potential at heterojunction for a-Si:H
V_B^*	V	Built-in potential at heterojunction
V_R	V	Reverse bias voltage under transient HMC measurement
V_1	V	dc applied-bias voltage for c-Si
$V_1(t)$	V	Voltage at time t across the depletion region in c-Si
V_2	V	dc applied-bias voltage for a-Si:H
v_{th}	cm/s	Thermal velocity of electrons
χ_1	eV	Electron affinity of c-Si
χ_2	eV	Electron affinity of a-Si:H
$\chi(SiO_2)$	eV	Electron affinity of SiO_2
W_1	cm	Width of the depletion region in c-Si
W_2	cm	Width of the depletion region in a-Si:H
$W_1(t)$	cm	Depletion width in c-Si at time t
$W_2(t)$	cm	Depletion width in a-Si:H at time t
W_{OB}	cm	Cross point at $E_{Fn} = E_{OB}$ in a-Si:H